my technical brief

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News and crop production advice from Frontier

OSR risk management in flea beetle hotspots

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Oilseed rape establishment in cabbage stem flea beetle (CSFB) hotspots remains a challenge this autumn. An emergency authorisation provided some insecticidal seed treatments in 2015 but, in the absence of a similar arrangement this year, growers have a limited arsenal of foliar insecticides to reduce pressure on developing plants. Crop production specialist, Paul Cartwright, explains alternative approaches.

Emergence of OSR often coincides with CSFB migration and as adult beetles feed, they cause characteristic 'shot-holing' of cotyledons and young leaves. In the most severe cases, beetles active at the soil surface can cut through emerging shoots.

CSFB's resistance to pyrethroids varies locally. Beetles caught in crops at harvest and emergence in 2015 showed susceptibility ranging from 100% to less than 50% in Rothamsted Research tests.

It's not possible to predict exact hotspot locations, but there is no indication that areas affected last year will be less pressured this season. The DEFRA funded spring pest survey showed some variation in CSFB larvae survival, with the Midlands, west and southwest of England reporting lower levels than the north, east and southeast.

Without seed treatments and with variable levels of control from foliar insecticides, growers in or near hotspots must focus on achieving rapid emergence and strong early growth. Crops faring best in 2015/16 were those not suffering from secondary stress factors when adults and larvae returned to feed.

Variety selection

No variety is CSFB resistant, but selecting varieties with vigorous early growth characteristics is especially important for mid-late August and September drillings. The quicker the crop develops four true leaves, the sooner the riskiest period passes.

Primary selection criteria should include strong combined disease resistance. High phoma and light leaf spot ratings, along with well-timed autumn and spring fungicide applications will all help stay ahead of disease.

Seedbed preparation

Irrespective of cultivation methods and drill type, some fundamental principles will remove limiting factors and lower plant stress:

- Alleviate compaction to allow unrestricted tap root development
- Conserve moisture
- Provide adequate nutrition in the seedbed or 'down the spout'
- Well consolidated seedbeds reduce slug mobility, improve seed-to-soil contact and ensure the best possible combination of residual herbicide activity with good crop safety.

Avoid increasing seed rates to allow for losses to pests, especially where drilling on wide rows. Over-thick crops compete with themselves, resulting in thin stems, poorer branching and weak canopy structure. This leaves crops at greater risk of lodging and less able to compensate for CSFB larval damage during winter. Start with 50 seeds/m^2. If 100% of plants establish, the crop isn't compromised, but if 50-60% don't survive, numbers are still sufficient to produce a well structured crop.

Foliar insecticides can help manage rape winter stem weevil and turnip sawfly larvae as well as CSFB. Use full rates of the most persistent pyrethroid formulations if treatment thresholds are reached, ensure good spray coverage and monitor the effectiveness of application. Avoid repeat spraying if resistance means control of the target pest is poor.

To identify an approach tailored to the specific needs of your land, talk to the experts.

"The quicker the crop develops four true leaves, the sooner the riskiest period passes."

Paul Cartwright
Crop production specialist

Early risk management for future profitability

With shrinking availability of chemistry and burgeoning disease resistance, Stuart Hill, national technical and development manager and Chris Piggott, seed commercial assistant explain how a structured rotational and cultural plan is critical in the pursuit of a sustainable profitable crop - not just this season but for years to come.

It is easy to look at spreadsheet yields and be tempted to continue the winter wheat and winter oilseed rape rotation. Challenge yourself, are these yields realistic to make long term decisions? A broad view of ongoing problems specific to your land will help make the best choices to tackle your challenges and secure long term profitability.

Grass weed control prior to cereal drilling

Black-grass tends to dominate thoughts when it comes to difficult grass weeds. However, Italian ryegrass and brome species are becoming more prevalent. Correct identification is critical to initiate an appropriate post harvest plan. Weed type and soil moisture after harvest will drive stubble control measures. Where high infestations of black-grass are evident, good ploughing can place black-grass seed below the germination zone resulting in a 70% seed viability decline each year. Consideration of the previous cultivation depth is needed to ensure seed is not returned to the surface. If soil is dry, wait for moisture which is essential for a stale seedbed.

For brome, technique depends on species. Sterile and great brome should be cultivated immediately after harvest to avoid inducing dormancy, whereas meadow and soft brome seed need to be left on the surface for several weeks prior to a stale seedbed approach to avoid dormancy. Ploughing is the favoured approach for all brome but a cultivation programme should be selected to tackle your farm's greatest challenges first. For Italian ryegrass, stale seedbeds will benefit as 95% of germination is in the autumn..

Delayed drilling, even to the point of waiting until spring, is an essential element of control. Mid October is the target start date to drill with black-grass fields. Increasing crop competition is critical. Increase seed rates to maximise pressure on black-grass emergence and tillering. This approach has achieved good results in Frontier trials at Staunton in Nottinghamshire.

Significant work has been completed assessing reductions of black-grass using different techniques (Table 1). Employ as many relevant options as possible to reduce weed pressure.

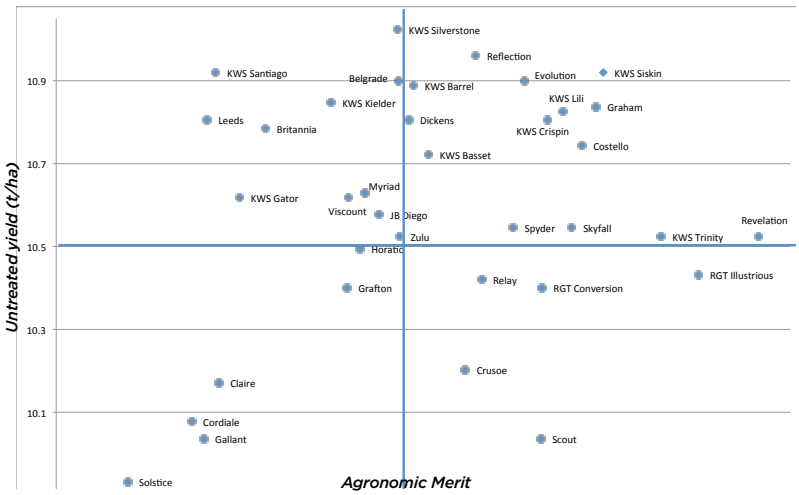
	% control of black-grass acheived		
Method	**Mean**	**Range**	**Comments**
Ploughing	69%	-82% to 96%	Rotational ploughing has considerable benefits
Delayed autumn drilling (by ≈3 weeks from mid September)	31%	-71% to 97%	The later the better - but increased risk
Higher seed rates	26%	+7% to 63%	The higher the better - but lodging issues
More competitive cultivars	22%	+8% to 45%	Useful, but marginal effects
Spring cropping	88%	+78% to 96%	Effective, but challenging on heavy soil and limited herbicides
Fallowing/ grass leys	70-80% per year (of seedbank)	-	Absence of new seeding critical

Table 1: Options for black-grass reduction Courtesy: Rothamsted Research

Managing disease risk

As septoria and yellow rust become more prolific, choice of variety is key. This varies according to farm circumstances and needs detailed discussion with your agronomist. A useful selection tool is the AHDB agronomic merit table which maps disease strengths:

Graph 1: Varietal agronomic risk (source AHDB)



Early Sept	Mid Sept	Early in main drilling window	Main drilling window	Late drilling	Light land	2nd wheat	Disease resistant
Scout (3) Claire(3) Grafton (4h)	Scout (3) Claire(3) RGT Conversion (3) Revelation (4s) RGT Illustrious (1) KWS Barrel (3) Graham (4h)	Solstice (1) Crusoe (1) Leeds (4s) JB Diego (4h) Relay (4h) KWS Kielder (4h) Evolution (4h) Revelation (4s) Illustrious (1)	Skyfall (1) Gallant (1) KWS Trinity (1) Cordiale (2) KWS Lili (2) Zulu (3) Viscount (4s) Reflection (4h) KWS Santiago (4h) KWS Gator (4h) KWS Siskin (2) Belgrade (4h)	Cordiale (2) Revelation (4s) KWS Gator (4h) KWS Siskin (2) Belgrade(4h) Winter or spring: Belepi (4s) Mulika (1)	Leeds (4s) KWS Gator (4h) Relay (4h) JB Diego (4h) Evolution (4h) Reflection (4h)	Solstice (1) Gallant (1) Skyfall (1) Cordiale (2) JB Diego (4h) KWS Gator (4h) Evolution (4h) KWS Kielder (4h)	Revelation (4s) Evolution (4h) Graham (4h) KWS Siskin (2)

Table 2: Varietal positioning for drilling *Key: 1-4 denotes group, h/s denotes hard or soft variety*

This year shows us graph 1 is more useful for selecting varieties resistant to septoria. Rust populations are very dynamic and can change year-on-year so previous resistance is not necessarily a good indicator of future performance.

Yellow rust can be further broken down into seedling and adult plant resistance. Two varieties with the same resistance score can differ in their seedling and adult resistance levels. Varieties that have good adult resistance but are seedling susceptible should benefit from a fluqinconazole based seed treatment.

Disease pressure can be significantly reduced by avoiding early drilling, or choosing a variety with high resistance where this can't be done. Ultimately, variety choice will support a robust fungicide programme inclusive of SDHI, triazole and multi-site chemistry to ensure resistance risk is minimised. Varietal choice and diversity can give us more flexibility to manage disease in season, especially when dealing with large areas.

Reducing the pest threat

Managing pest risk is more challenging. Variety choice can mitigate against Orange Wheat Blossom Midge (OWBM) which can be a localised sporadic issue. Selection is straightforward with varieties either resistant to OWBM or not. OWBM affects grain quality so care is particularly important in milling varieties where only Skyfall is resistant. Other varieties with resistance are Barrel and Basset (in group 3), and Leeds, Myriad, Viscount, Reflection, Santiago, Kielder and Gator (in group 4).

Cereal seed treatments

Seed treatments provide one of the most economic ways of applying crop protection. Pest pressure will mean cereal crops drilled in all but the very latest drilling slots will benefit from Prothioconazole + Clothianidin (Redigo Deter). BYDV is very evident this year due to the warm late autumn and winter resulting in extended aphid pressure. This has been exacerbated by restrictions on pyrethroid buffer zones and more widespread resistance. Assuming a seed rate of 150kg/ha, Redigo Deter will provide 8 weeks' protection from aphid virus transmission without the cost and time involved with a foliar insecticide application.

Trials have shown a significant yield increase (circa 2t/ha) from Redigo Deter compared to a foliar programme, indicating protection from disease and pest pressure is possible throughout the September and October drilling period. In addition, Redigo Deter provides seed with some initial slug protection, without the buffer zone challenges experienced when employing pelleted control. NB: Drilling of seed treated with Redigo Deter must be complete before 31st December.

Even with seed treatments, monitoring the crop is important because in an open winter infections remain a threat through until spring.

Cereal crops are at risk from wheat bulb fly, particularly in certain rotations such as following a grass ley. Austral Plus seed treatment will give some early control but not through to the key early spring stage of the wheat bulb fly lifecycle. Early drilling, where possible, or higher seed rates are mitigating tactics.

Disease control from seed treatments reduces risk from disease during early crop stages. Fluquinconazole treatments (Galmano or Jockey) give early protection from rusts, septoria, and fusarium. Some of the highest yielding varieties such as Santiago, Reflection, and Kielder are prone to yellow rust. Using a fluquincoazole treatment here will help support subsequent fungicide applications.

Seed treatments to support rotational positioning are a useful tool for growers. In second and third cereal situations, take-all risk is dramatically increased but can be mitigated with the use of Silthiofam (Latitude).

Ultimately, a significant amount of preparation can be completed before turning a wheel in the field. Whether that is soil structuring and rotation decisions, variety, pest, weed or disease management choices, pre season planning will help deliver your ongoing farm objectives.

"A broad view of ongoing problems specific to your land will help make the best choices to tackle your challenges."

Stuart Hill
National technical and development manager

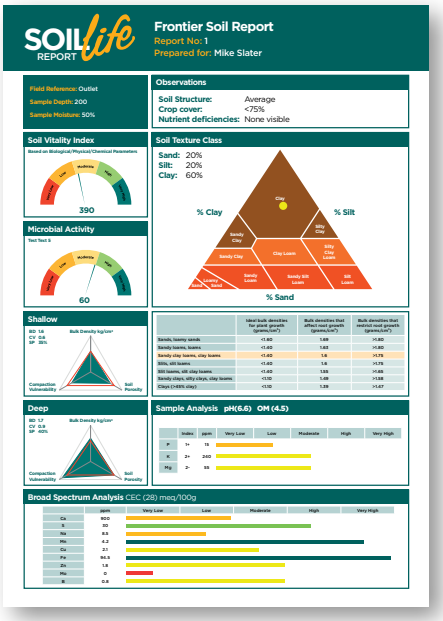
Radish - the star of the cover crop line-up

As discussed elsewhere in this edition, soil is the most important asset on the farm. It's physical, chemical and biological compositions are the three key characters that determine how well your crops will grow. Frontier's seed business development manager, Paul Brown explains that while it is likely many UK soils do not currently have the correct balance, cover crops and in particular radish, will help boost organic matter deficits in most soils.

Knowing your soil's starting point

There is much discussion about improving soil health but it is not always clear what this actually means or how to achieve it. In Frontier's wide involvement with soils and cover cropping we have seen a strong need to begin with a measurement of soil condition to assess vitality. After all, it is difficult to implement a plan for improvement without taking an initial measurement.

To help with this Frontier has recently developed a 'Soil Life report' that will provide the necessary base of knowledge to work from. The report takes an integrated view of a grower's soils' chemical, physical and biological make-up. Frontier's soil experts then can discuss how soils might be improved by combining a range of tactics including cultivations, drilling, tyres, controlled traffic, manures, cover crops and rotation.



The Soil Life report will help give direction to answer common questions such as: Can I direct drill into these soils? Do I need to subsoil?

In a good top soil there is likely to be 4 -5 tonnes of soil biota per hectare. Soil biota is the bacteria, fungi, and invertebrates that are vital for good yields but are commonly reduced in many arable soils today. Organic matter is the fuel that powers the soil biota engine and the Soil Life report measures both organic matter and soil biota.

Good soils are also typically 25% water, 25% air and 50% solid particles. With modern machinery and rotations the air percentage is often much reduced. The root structure of cover crops can help particularly with the air and water balance through improved structure.

Additionally, cover crops can be used to supply high levels of fresh green organic matter that will improve soil structure, soil fertility and biodiversity.

Enter radish – the high performance cover crop

In many trials in recent years Frontier has consistently seen radish or radish-based mixtures produce the highest levels of organic matter, with the deepest roots and the top levels of nitrogen capture from the soil. The results from a recent autumn/winter trial in Essex below show a typical comparison of cover crop effectiveness. Crops were harvested 18th January 2016 and no fertiliser was applied.

Cover crop	Fresh weight tonnes/ha	Dry matter % - Organic matter tonnes/ha	N in above ground crop Kg N/ha
Mustard	10.4	2.1	52
Black oats	15.5	2.6	66
Radish	22.6	2.9	145
Radish/oat mix	25.1	3.0	118
Mustard/oat mix	12.8	1.8	72
Radish/oat phacelia mix	21.1	2.8v	110

These trials results are typical and demonstrate that radish is the best choice to collect nitrogen left in the soil from the previous crop. This prevents nitrogen leaching into watercourses and efficiently captures what is a valuable and costly nutrient.

Radish – now allowed in EFA cover crops

Now in the second year of EFA requirements under the BPS, radish is a recently added but very welcome allowable species in EFA catch and cover crop mixtures. This will help catch and cover crops to perform even better. The addition of radish is the only change to the system in this second year. Many growers will choose catch and cover crops so the table on page 5 shows a timely reminder of the key rules in order to meet requirements. There are different rules in Scotland and England and EFAs do not apply at all in Wales..

Radish variety	Characteristics	
Siletina	Early to flower/Fast growth	Least cost seed/Late August sow
Siletta Nova	Later to flower	Early August sow
Barracuda	Very late to flower	Beet Cyst Nematode reduction
Bokito	High leaf percentage giving good grazing	Beet Cyst Nematode reduction
Defender or Contra	Maximum nematode reduction	Beet Cyst Nematode reduction plus root knot, stubby root and pratylenchus reduction
Compass	Frost kill susceptible	Most radish will stand minus 8 degrees, but Compass does not tolerate frost

EFA Type	Rule	England	Scotland
Cover crop	Establish by:	1st October	1st October
	Retain until:	15th January	31st December
	Species:	Has to be a mix of at least one cereal from the list below plus at least one non-cereal Cereal: barley, oats and rye Non-cereal: vetch, mustard, radish phacelia and lucerne Alternatively, can be under sown grass	Any two from: Barley Oats Rye Triticale Clover Vetch Mustard Radish Phacelia Lucerne
Catch crop	Establish by:	31st August	1st August
	Retain until:	1st October	31st December
	Species:	As above for cover crop Alternatively, can be under sown grass	Has to be only grass under sown in previous crop

Variety selection

Whether choosing radish to sow alone or as part of a mix, whether for EFA or not, careful thought should be given to variety choice and percentage inclusion in any mix. Mixture choice is important for oats and rye, but is especially significant for radish where there is such a wide range of choice providing a range of different benefits.

All radish crops can provide: high levels of organic matter production, capture of residual nitrogen from previous crops, deep rooting to aid soil structure, and fast growth and ground cover.

Radish should be selected according to the additional characteristics that will suit your situation the most. Varieties are available that will offer: fast growth, early flowering, later flowering, high leaf percentage for grazing, and nematode reduction properties. The table above illustrates the choice available.

Bokito oil radish provides good grazing


Sugar beet (right) 30% yield benefit after radish

Contact your local Frontier or Kings team to find out how a Soil Life report, coupled with the introduction of a radish crop, could kick start a soil improvement process for your land.

"Cover crops can be used to supply high levels of green organic matter that will improve soil."

Paul Brown
Seed business development manager

Improving your soils

With increasing pressure on yields, taking care of our land is essential. There are two main threats to the vitality of arable soils; compaction and the decline in organic matter. The two factors are interlinked, as a decline in organic matter reduces the capacity of soil to resist compaction. Fertiliser technical development manager, Mike Slater and SOYL commercial director, Simon Parrington explain the importance of soil vitality and how to improve it.

What does healthy soil look like?

To ensure that the root systems of our crops can develop through the full soil volume, soil density should be around 1.4kg/l. At this density the sand, silt and clay fractions will comprise a little over half the total soil volume, with the soil pores half filled with water and organic matter making up the rest. In this situation the soil will be aerobic, allowing the soil biota to thrive and ensure good nutrient and water uptake by our crops.

The axle weights of most farm machinery have risen dramatically in recent years, increasing the risk and depth of compaction in our soils. This can be mitigated by choosing appropriate tyres at the correct pressures. As the total weight of machinery increases, the number of days that it can be used without risking additional damage significantly reduces, but with the demands to cover more hectares, compromises are inevitable. In the future, more tractors will have the capacity to vary tyre pressures for field and road use. Taking time to check tyre pressures on all the machinery on farm will help reduce the risk of compaction.

Good soils are essential for successful crops

Besides restricting root development, compacted soils will also restrict drainage. This means they fill with water more quickly, leading to loss of soil air and progressively turn anaerobic. Prolonged waterlogging will cause root death. At the same time, the soil biota will degenerate and as the microbes struggle for oxygen, denitrification will occur, losing nitrogen as nitrogen gas and nitrous oxide, a severe greenhouse gas, from our soils.

How can I make a difference?

Minimising trafficking of land and adopting controlled traffic systems will help to minimise further compaction. However, repairing compacted soils will be essential in many fields. On clay soils in dry conditions, vertical cracking will help naturally repair damage. Deep rooting cover crops will also help break up soil pans, but in many situations sub soiling will still be the primary method of loosening soils. For sub soiling to be effective, soils must be dry enough to achieve fracture to the surface of the soil. If deep compaction is to be tackled, tines will need to be set at two depths to achieve full soil fracture.

If soils are too moist or fracture to the surface is not achieved, compaction can be made worse. In the past, some sub soilers have loosened too much soil. A well structured soil should have a good crumb structure in the top six to eight inches and below this should be a column structure to allow root penetration to depth and drainage while still being able to support traffic. There should always be a balance between loosening soils and maintaining carrying capacity. When any soil conditioning machine is in use, holes should be dug to check that the desired soil improvement is being achieved and that the tines are set at the correct depth to address the compaction in each field.

Variable depth cultivation

Inaccurate cultivation depth can be harmful to soils. To avoid over or under calculating the disturbance needed, precision techniques can be extremely valuable. SOYL's variable depth control unit, AUTOdepth, uses a sensor to maintain the required cultivation depth and automatically adjusts the cultivator's hydraulic settings to alter the working depth. When paired with SOYL's new Topsoil Mapper, the two systems work seamlessly together to ensure the correct cultivation depth is used for every soil type in the field. Providing a cost effective variable depth cultivation option for growers, the Topsoil Mapper is an innovative sensor system which automatically maps soil and field characteristics in real time so that operations are carried out at the optimum depth.

The Topsoil Mapper sensor system is mounted on the weight block or front linkage of the tractor. Using electromagnetic induction, an array of transmitters and receiving coils automatically calculate the variation in soil properties, continuously measuring soil moisture, soil texture and the depth to compacted layers throughout the topsoil profile. It has been optimised to take into account the speed of the tractor, cultivator size and the response time of the hydraulic system.

As well as improving and protecting soils, cultivating at variable depths creates savings in diesel and increases average work rates through reduced load on machinery. The accurate control provided is particularly important in shallow soils.

Improving organic matter levels

Restoring soil organic matter levels will transform the yield potential of any field. Organic matter is vital in heavy soils to help keep them aerobic and free draining. On light soils, it's essential for retaining nutrients and water, which are only held on clay particles and organic matter. Weight for weight, organic matter holds fourteen times as much water and nutrient as clay. Equally, if not more important, organic matter will support the soil biota by providing the food source for the microbes.

Long term organic matter, mainly humus, is virtually inert in the soil. It takes several years to break down, to stimulate soil microbes and thus nutrient use efficiency, so fresh organic material is needed. Farm yard manure and similar materials are an excellent source that provide digestible nutrients for the soil biota. Straw incorporation will help, but to be broken down into true soil organic matter there is a demand for nitrogen from the soil.

For many arable farms with no access to manures, cover crops are an excellent alternative. Cover crops will provide some lignified material to contribute to longer term soil organic matter and, when incorporated back into the soil rather than grazed, will also supply digestible material to feed the microbial populations. This is because, given a food source, microbes will quickly develop to increase soil vitality and nutrient uptake by subsequent arable crops.

By minimising further compaction, rectifying compacted fields and increasing organic matter levels on arable soils to 4% and above, our soils will be capable of sustaining high yields well into the future.

Soil compaction and declining organic matter are interlinked

"Repairing compacted soils is essential in many fields."

Mike Slater
Fertiliser technical development manager

Get ahead with stewardship this autumn

As we wait to see how the UK's exit from the EU could affect stewardship plans, it's worth noting that existing agreements are still valid and delivery should continue as normal. The application window for Countryside Stewardship is still in place. With this in mind, Kings central technical advisor, Meehal Grint, recommends autumn sowing of stewardship options to ease workload pressures and reap benefits through winter as well as spring and summer.

With generally lower weed, time and pest pressures, autumn offers an excellent opportunity to establish stewardship options such as pollen and nectar mixes, grass margins, autumn sown wild bird seed mixtures and floristically enhanced grass margins.

Autumn drilling provides opportunity to get ahead before spring, when the drill will be busy elsewhere on the farm and, given the unpredictable weather of the last few seasons, reduces risk too. It also provides untold benefits for farmland wildlife.

Wild bird seed mixtures

Wild bird seed mixtures are a particularly valuable crop, providing habitat for insects to overwinter in along with a subsequent source of pollen for them, which is critical to farmland birds and especially those that are ground nesting, such as grey partridge. Insect rich habitat is vital for grey partridge chicks which survive on insects alone for the first 10 days. As the season continues, the crop keeps providing cover for the chicks from the elements and predators. It also provides winter feed for all farmland birds.

Kings Cornfield Annual mix

Wild bird seed mixtures can also be grown under the fallow option of an Ecological Focus Area, so are worth considering even for those not in a stewardship scheme.

For advice on margins, establishment techniques and stewardship options, speak to your local Kings advisor.

Floristically enhanced margins

Considered tricky by some, floristically enhanced margins can be relatively simple to manage successfully with careful planning. Taking advice is essential and the approach could vary from starting from scratch with a stale seedbed to overseeding an existing grass margin. This is the most cost effective option when done correctly and often the simplest to manage.

To transform a grass margin into one which is floristically enhanced, it's key to know which grass species are already present. Finer grasses such as crested dogstail, fescues and bents are less aggressive than those such as cocksfoot and timothy. As such, they won't outcompete flowers, though some thicker grasses at background level will be manageable. Top hard during August and early September, ideally removing grass cuttings. Don't be afraid to give the sward a hard time by scuffing it up with a power harrow or light set of discs. Then select a native flower mixture to drill in autumn.

Flower seed should ideally be drilled with a grass seeding unit, which blows seed onto the surface while spring tines scratch the seed in. Flowers must not be established deeper than the sub surface. Alternatively, use a light harrow to remove dead grass and scratch the surface, followed by a conventional drill, used as a measuring device rather than as a drill blowing seed onto the surface. Follow this with a Cambridge roll to ensure good seed to soil contact.

In the following 12 to 18 months, mow regularly to allow light into the sward and encourage flowers to tiller. Remove cuttings where possible. Applying a low rate of an appropriate graminicide in spring will help to check grass growth and allow flowers to establish. Results will not be instant as these margins can take two to three years to fully establish, but with regular management, rewards will come.

"Autumn offers an excellent opportunity to establish stewardship options."

Meehal Grint
Kings central technical advisor